

# 2-Input 2-Output Video Switch Monolithic IC MM1120

## Outline

This is a 2-input, 2-output 3-circuit high performance video switch IC for video/audio signal switching. It is ideal for use in TV/BS switching.

## Features

- 1. 1 video signal circuit, 2 audio signal circuits
- 2. 1 built-in 75Ω driver circuit
- 3. Current consumption 17mA typ.
- 4. Operating power supply voltage range 9~12V
- 5. Frequency response 10MHz (V<sub>OUT1</sub>), 7MHz (V<sub>OUT2</sub>)
- 6. Crosstalk Video signal circuit : 60dB (at 4.43MHz)  
Audio signal circuit : 80dB (at 1kHz)

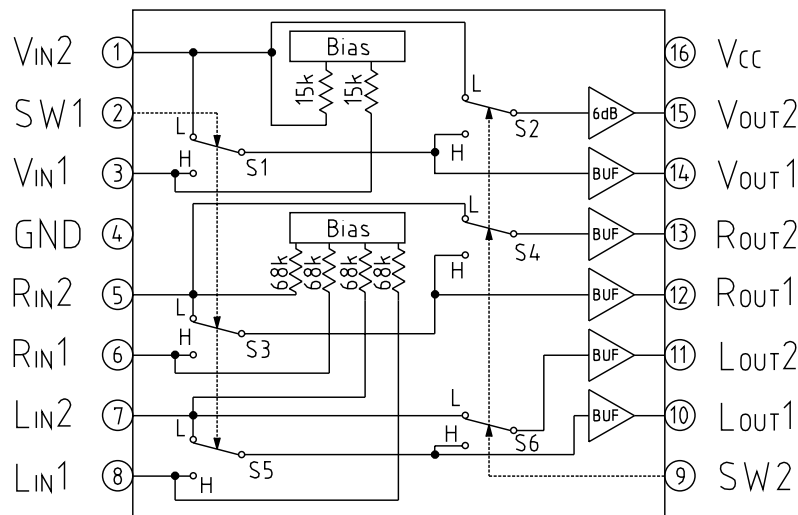
## Package

SSOP-16A (MM1120XF)

## Applications

- 1. TV with built-in BS

## Block Diagram

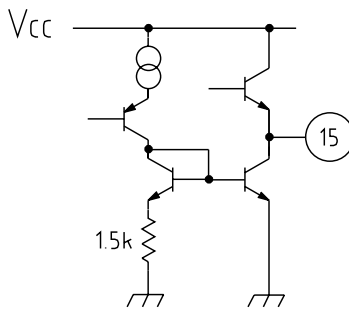


Control input truth table

SW1	SW2	OUT1	OUT1
L	L	IN2	IN2
L	H	IN2	IN2
H	L	IN1	IN2
H	H	IN1	IN1

Pin Description

Pin no.	Pin name	Function	Internal equivalent circuit diagram
1 3	V <sub>IN</sub>	Video input	
2 9	SW	Switch	
4	GND	Ground	
5 6 7 8	R <sub>IN</sub> and L <sub>IN</sub>	Audio input	
10 11 12 13	R <sub>OUT</sub> and L <sub>OUT</sub>	Audio output	
14	V <sub>OUT1</sub>	Video output 1	

15	V <sub>out2</sub>	Video output 2	
16	V <sub>cc</sub>	Power supply	

### Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Ratings	Units
Storage temperature	T <sub>STG</sub>	-40~+125	°C
Operating temperature	T <sub>OPR</sub>	-20~+75	°C
Power supply voltage	V <sub>CC</sub> max.	15	V
Allowable loss	P <sub>d</sub>	500	mW

### Electrical Characteristics (Except where noted otherwise, Ta=25°C, V<sub>cc</sub>=8V~13V, V<sub>1</sub>=0V, V<sub>2</sub>=0V, SG-1, SG-2, SG-3, no signal)

Item	Symbol	Measurement pin	Measurement conditions	Min.	Typ.	Max.	Units
Operating power supply voltage	V <sub>CC</sub>	V <sub>CC</sub>		8.00		13.0	V
Consumption current	I <sub>CC1</sub>		V <sub>CC</sub> =9V		16.0	21.0	mA
	I <sub>CC2</sub>		V <sub>CC</sub> =12V		17.0	22.0	mA
<b>V<sub>IN1</sub>-V<sub>OUT1</sub> V<sub>1</sub>=V<sub>2</sub>=V<sub>CC</sub>, SW1 : B, V<sub>IN2</sub>-V<sub>OUT1</sub>, SW1 : A</b>							
Voltage gain	G <sub>V1</sub>	TP2	SG1 : Sine wave 1V <sub>P-P</sub> , 0.1MHz	-0.5	0	0.5	dB
Frequency characteristic	F <sub>C1</sub>		SG1 : Sweep signal 1.0V <sub>P-P</sub> , 10MHz/0.1MHz	-1.0	0	1.0	dB
Differential gain	D <sub>G1</sub>	TP8	SG1: Staircase wave 1V <sub>P-P</sub> APL=10, 50, 90%		0	±3	%
Differential phase	D <sub>P1</sub>		SG1: Staircase wave 1V <sub>P-P</sub> APL=10, 50, 90%		0	±3	deg
<b>V<sub>IN2</sub>-V<sub>OUT2</sub> SW1 : A, V<sub>IN1</sub>-V<sub>OUT2</sub> V<sub>1</sub>=V<sub>2</sub>=V<sub>CC</sub>, SW1 : B</b>							
Voltage gain	G <sub>V2</sub>	TP1	SG1 : Sine wave 1V <sub>P-P</sub> , 0.1MHz	5.5	6.0	6.5	dB
Frequency characteristic	F <sub>C2</sub>		SG1 : Sweep signal 1.0V <sub>P-P</sub> , 7MHz/0.1MHz	-1.0	0	1.0	dB
Differential gain	D <sub>G2</sub>	TP7	SG1 : Staircase wave 1V <sub>P-P</sub> APL=10, 50, 90%		0	±3	%
Differential phase	D <sub>P2</sub>		SG1 : Staircase wave 1V <sub>P-P</sub> APL=10, 50, 90%		0	±3	deg
<b>R<sub>IN1</sub>-R<sub>OUT1</sub> V<sub>1</sub>=V<sub>2</sub>=V<sub>CC</sub>, SW2 : B, R<sub>IN2</sub>-R<sub>OUT1</sub> SW2 : A</b>							
Voltage gain	G <sub>V3</sub>	TP4	SG2 : Sine wave 2.5V <sub>P-P</sub> , 1kHz	-0.5	0	0.5	dB
Total harmonic distortion	T <sub>HD1</sub>		SG2 : Sine wave 2.5V <sub>P-P</sub> , 1kHz		0.01	0.1	%
Output noise voltage	V <sub>N1</sub>		15kHz band		3	50	μVrms
<b>R<sub>IN2</sub>-R<sub>OUT2</sub> SW2 : A, R<sub>IN1</sub>-R<sub>OUT2</sub> V<sub>1</sub>=V<sub>2</sub>=V<sub>CC</sub>, SW2 : B</b>							
Voltage gain	G <sub>V4</sub>	TP3	SG2 : Sine wave 2.5V <sub>P-P</sub> , 1kHz	-0.5	0	0.5	dB
Total harmonic distortion	T <sub>HD2</sub>		SSG2 : Sine wave 2.5V <sub>P-P</sub> , 1kHz		0.01	0.1	%
Output noise voltage	V <sub>N2</sub>		15kHz band		3	50	μVrms

LIN1 –LOUT1 V1=V2=VCC, SW3 : B, LIN2 –LOUT1 SW3 : A							
Voltage gain	Gv5	TP6	SG3 : Sine wave 2.5V <sub>P-P</sub> , 1kHz	-0.5	0	0.5	dB
Total harmonic distortion	T <sub>HD3</sub>		SG3 : Sine wave 2.5V <sub>P-P</sub> , 1kHz		0.01	0.1	%
Output noise voltage	V <sub>N3</sub>		15kHz band		3	50	μV <sub>rms</sub>
LIN2 –LOUT2 SW3 : A, LIN1 –LOUT2 V1=V2=VCC, SW3 : B							
Voltage gain	Gv6	TP5	SG3 : Sine wave 2.5V <sub>P-P</sub> , 1kHz	-0.5	0	0.5	dB
Total harmonic distortion	T <sub>HD4</sub>		SG3 : Sine wave 2.5V <sub>P-P</sub> , 1kHz		0.01	0.1	%
Output noise voltage	V <sub>N4</sub>		15kHz band		3	50	μV <sub>rms</sub>
Output offset voltage							
V <sub>OUT1</sub>	V <sub>off1</sub>	TP2	DC level difference when V1=0V and V1=V <sub>CC</sub>		0	±15	mV
V <sub>OUT2</sub>	V <sub>off2</sub>	TP1	DC level difference when V2=0V and V2=V <sub>CC</sub>		0	±30	mV
R <sub>OUT1</sub>	V <sub>off3</sub>	TP4	DC level difference when V1=0V and V1=V <sub>CC</sub>		0	±15	mV
R <sub>OUT2</sub>	V <sub>off4</sub>	TP3	DC level difference when V2=0V and V2=V <sub>CC</sub>		0	±15	mV
L <sub>OUT1</sub>	V <sub>off5</sub>	TP6	DC level difference when V1=0V and V1=V <sub>CC</sub>		0	±15	mV
L <sub>OUT2</sub>	V <sub>off6</sub>	TP5	DC level difference when V2=0V and V2=V <sub>CC</sub>		0	±15	mV
Input impedance							
V <sub>IN</sub>	Ri1		V <sub>IN1</sub> and V <sub>IN2</sub>		15		kΩ
R <sub>IN</sub>	Ri2		R <sub>IN1</sub> and R <sub>IN2</sub>		68		kΩ
L <sub>IN</sub>	Ri3		L <sub>IN1</sub> and L <sub>IN2</sub>		68		kΩ
Output impedance							
V <sub>OUT1</sub>	Ro1				50		Ω
R <sub>OUT</sub>	Ro2		R <sub>OUT1</sub> and R <sub>OUT2</sub>		100		Ω
L <sub>OUT</sub>	Ro3		L <sub>OUT1</sub> and L <sub>OUT2</sub>		100		Ω
Crosstalk *1							
V <sub>IN</sub> → V <sub>OUT</sub>	C <sub>T1</sub>	TP7	SG1 : Sine wave 1V <sub>P-P</sub> , 4.43MHz ① V1=V <sub>H</sub> , V2=V <sub>L</sub> , SW1 : B ② V1=V2=V <sub>H</sub> , SW1 : A		-60	-50	dB
	C <sub>T2</sub>	TP2	SG1 : Sine wave 1V <sub>P-P</sub> , 4.43MHz ① V1=V <sub>L</sub> , V2=V <sub>H</sub> , SW1 : B ② V1=V <sub>H</sub> , V2=V <sub>L</sub> , SW1 : A		-60	-50	dB
R <sub>IN</sub> → R <sub>OUT</sub>	C <sub>T3</sub>	TP3	SG2 : Sine wave 2.5V <sub>P-P</sub> , 1kHz ① V1=V <sub>H</sub> , V2=V <sub>L</sub> , SW2 : B ② V1=V2=V <sub>H</sub> , SW2 : A		-80	-70	dB
	C <sub>T4</sub>	TP4	SG2 : Sine wave 2.5V <sub>P-P</sub> , 1kHz ① V1=V <sub>L</sub> , V2=V <sub>H</sub> , SW2 : B ② V1=V <sub>H</sub> , V2=V <sub>L</sub> , SW2 : A		-80	-70	dB
L <sub>IN</sub> → L <sub>OUT</sub>	C <sub>T5</sub>	TP5	SG3 : Sine wave 2.5V <sub>P-P</sub> , 1kHz ① V1=V <sub>H</sub> , V2=V <sub>L</sub> , SW3 : B ② V1=V2=V <sub>H</sub> , SW3 : A		-80	-70	dB
	C <sub>T6</sub>	TP6	SG3 : Sine wave 2.5V <sub>P-P</sub> , 1kHz ① V1=V <sub>L</sub> , V2=V <sub>H</sub> , SW3 : B ② V1=V <sub>H</sub> , V2=V <sub>L</sub> , SW3 : A		-80	-70	dB
V <sub>IN1</sub> → R <sub>OUT2</sub>	C <sub>T7</sub>	TP3	SG1 : Sine wave 1V <sub>P-P</sub> , 4.43MHz 1 V1=V <sub>H</sub> , V2=V <sub>L</sub> , SW1 : B		-55	-45	dB
Switch input voltage							
Switch input voltage H	V <sub>IH</sub>		IC internal switch H level	2.1			V
Switch input voltage L	V <sub>IL</sub>		IC internal switch L level			0.7	V

\*1 Crosstalk

V<sub>H</sub>=2.1V, V<sub>L</sub>=0.7V

C<sub>T</sub> is obtained by the following formula given input signal is V<sub>IN</sub> and output signal is V<sub>OUT</sub>

$$C_T = 20 \log \frac{V_{OUT}}{V_{IN}} \text{ [dB]}$$

Measuring Circuit

